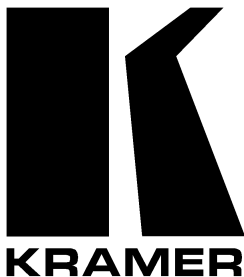


Kramer Electronics, Ltd.



USER MANUAL

Model:

648

FireWire 800/1394b Optical Repeater

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1 Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite range of problems that confront the video, audio and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 350-plus different models now appear in 8 Groups¹, which are clearly defined by function.

Congratulations on purchasing your Kramer DigiTOOLS **648 FireWire**² *800/1394b Optical Repeater*, which is ideal for:

- Extending IEEE1394b protocol signals for high-speed external disk drives
- Professional scanners and printers
- Cameras for surveillance systems, digital audio and video
- Home entertainment components

The package includes the following items:

- **648 FireWire 800/1394b Optical Repeater**
- One FireWire 9-pin to 6-pin connector cable
- Power adapter (12V DC Input)
- This user manual³

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high resolution cables⁴

1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Scalers; and GROUP 8: Cables and Connectors

2 FireWire, also known as IEEE 1394, was designed to be a universal interconnect, eliminating the need for many different input/output connectors. The 1394 bus is a versatile, high speed, and inexpensive way to connect a wide variety of consumer electronic devices. There are currently two standards: the original FireWire, now referred to as FireWire 400 or IEEE 1394, and FireWire 800 or IEEE 1394b. As the names imply, the maximum speed of FireWire 400 is 400 Mbps, whereas FireWire 800 maximum speed is 800 Mbps

3 Download up-to-date Kramer user manuals from the Internet at this URL: <http://www.kramerelectronics.com>

4 The complete list of Kramer cables is on our Web site at <http://www.kramerelectronics.com>

3 Overview

The high performance **648 FireWire 800/1394b Optical Repeater** can connect between a host computer and remotely located peripheral devices via fiber optics. IEEE 1394b protocol signals can be extended to up to 500m (1640 feet), with a data rate of up to 800Mbps in full duplex mode¹.

In particular, the **648**:

- Fully complies to the 1394b-2002 standard and is backward-compatible to the 1394a-2000 and 1995 standards at 100/200/400Mbps
- Includes two electrical bilingual ports and an optical duplex LC fiber optic connector (transmitter and receiver)
- Includes full P1394a support, that is, Connection Debounce, Arbitrated Short Reset, Multispeed Concatenation, Arbitration Acceleration, Fly-By Concatenation, Port Disable/Suspend/Resume
- Meets Class 1 eye safety, certified by FDA/CDRH and IEC 60825-1
- Works with both PC and Mac computers
- Provides power through the connector

3.1 About FireWire

The Kramer DigiTOOLS **648** is based on FireWire which:

- Is a serial bus standard² that enables quick universal interfacing between video and computer hardware items³
- Is simple to use and operates independently of the host system, letting you connect more items than you otherwise could (as a computer only has limited ports available), and for extended distances. Several can be cascaded to create up to a 63 port FireWire Repeater / HUB
- Supports Plug and Play⁴, hot swapping⁵ and isochronous⁶ and asynchronous applications

1 While the maximum cable length for transferring a 1394b protocol signal is currently 4.5 meters, the optical cables support extension to up to 500 meters

2 Originally developed by Apple™ and published as IEEE 1394 by the Institute of Electrical and Electronics Engineers

3 Hardware items include digital cameras, computers, printers, VCRs, CD-ROMs, hard disks, scanners and graphic cards

4 Configures automatically. Whenever a device is added or removed the 1394 bus re-enumerates

5 You can connect and disconnect inputs and outputs dynamically, without having to restart the computer or cycle power

6 Video / audio applications require constant transfer rates, which the serial bus provides by supporting isochronous transfers

3.2 About the FireWire Repeater

Many computers today come with one or more FireWire ports on the rear panel. These ports let you attach many devices to your computer quickly and easily. The operating system also supports FireWire, so the installation of the device drivers is quick and simple.

Connecting a FireWire device to a computer is easy – you just plug it into the port. If it is an uninstalled FireWire device, the operating system auto-detects it and installs software support for it automatically. If the device has already been installed, the computer activates it and starts talking to it.

You plug the hub into your computer, and then plug your devices (or other hubs) into the hub. By chaining hubs together, you can build up to 63 available FireWire ports on a single computer.

A FireWire repeater has bi-directional signals. The standard defines FireWire as a Peer-to-Peer connection; that is why two devices, or a device and a computer can talk to each other.

It is important to note that everything depends on your computer's software, and the firmware of the devices. Sometimes, it is possible that a computer can work with many FireWire devices simultaneously (like a distribution amplifier), sometimes it can work with many devices in time-sharing mode (like a switcher). But most often it is possible to work one-to-one. In this case, you have to disconnect all the devices that are unnecessary at this time and leave only two of them. Since FireWire is a hot-plug standard, you can connect/disconnect devices at any time.

Repeaters can be powered or unpowered. The FireWire standard lets devices draw their power from their FireWire connection. Obviously, a high-power device, like a professional DV camcorder, will have its own power supply, but low-power devices like a Webcam derive their power from the bus in order to simplify them. The power for this (up to 1.5 amps at 12 volts) comes from the computer.

If you have several self-powered devices, then your repeater does not need to be powered, as none of the devices connecting to the repeater needs additional power, and the repeater itself can derive power from the computer. If you have many unpowered devices, you probably need a powered repeater.

3.3 Recommendations for Achieving the Best Performance

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise-levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances and position your Kramer **648** away from moisture, excessive sunlight and dust

4 Your 648 FireWire 800/1394b Optical Repeater

Figure 1, Figure 2 and Table 1 define the **648**:

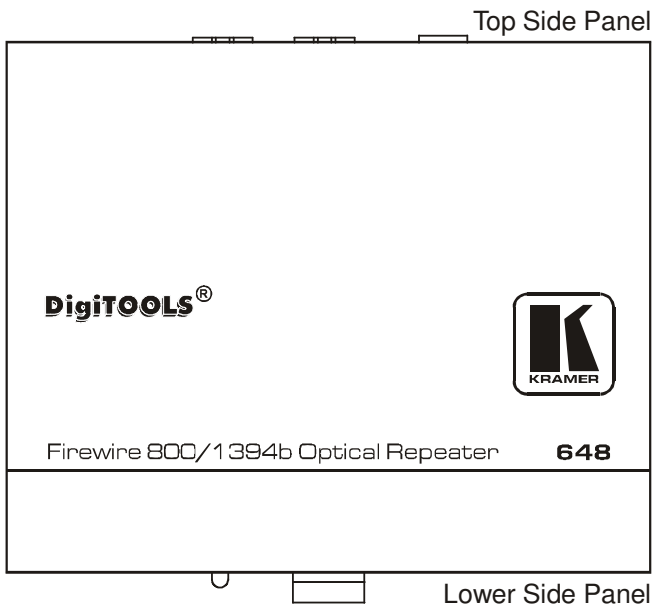


Figure 1: 648 FireWire 800/1394b Optical Repeater

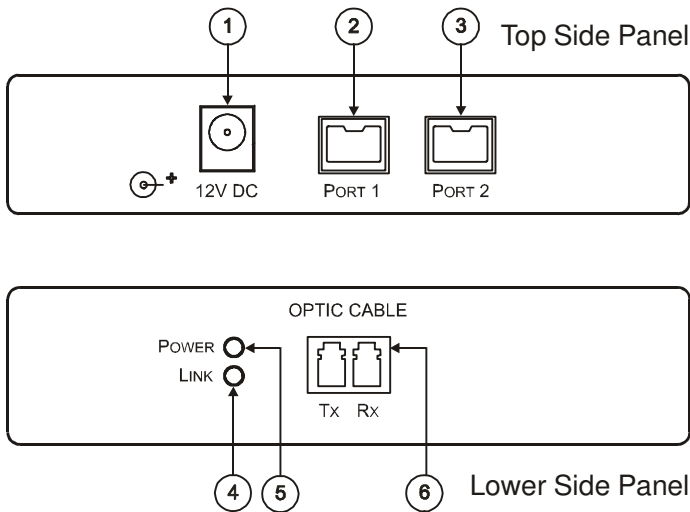


Figure 2: 648 FireWire 800/1394b Optical Repeater – Top and Lower Side Panels

Table 1: 648 FireWire 800/1394b Optical Repeater Features

#	Feature		Function
1	12V DC		+12V DC connector for powering the unit (if required)
2	PORT 1	9-pin FireWire Bilingual ¹ Connector	Connects to the FireWire device 1
3	PORT 2	9-pin FireWire Bilingual ¹ Connector	Connects to the FireWire device 2
4	LINK LED		Lights when a cable from an external device is connected
5	POWER LED		Illuminates when receiving power
6	OPTIC CABLE	Tx Multimode Optical Fiber Connector	For transmitting signals
		Rx Multimode Optical Fiber Connector	For receiving signals

¹ The Bilingual connector has a smaller top key on the cable, is built for high-speed devices, and offers backward compatibility with older IEEE 1394a devices

5 Using the 648 FireWire 800/1394b Optical Repeater

You can use your **648 FireWire 800/1394b Optical Repeater** for various applications. For example, you can connect your host computer to:

- A remote peripheral device (see section 5.1)
- Several surveillance cameras (see section 5.2)
- IEEE 1394a standard devices (see section 5.3)

Before connecting and using your repeater, make sure that you have:

- A 1394a or 1394b controller (properly installed) with a DS/bilingual port on your PC or Mac system
- Correctly installed the drivers of the devices you are about to connect on your host computer

5.1 Connecting the 648 to a Peripheral Device¹

To set up the **648 FireWire 800/1394b Optical Repeater** units, as the example in Figure 3 illustrates, do the following²:

1. Identify one **648** unit as upstream³ and the other one as downstream⁴.
2. Connect the upstream unit to the downstream unit, using the duplex LC patch cord fiber-optic cable⁵ in the following way:
 - The Tx (upstream³) to the Rx (downstream⁴)
 - The Rx (upstream³) to the Tx (downstream⁴)
3. Connect the FireWire port on the host computer to the PORT 1 9-pin FireWire connector⁶ on the upstream³ **648** unit, using a copper FireWire cable.
4. Connect the downstream⁴ PORT 1 9-pin FireWire connection⁶, to the FireWire port of the peripheral device.

¹ Such as a video camcorder, a scanner, a hard disk drive and so on

² Not all ports need to be connected. Any unused port should simply be left unconnected

³ The host computer side

⁴ The peripheral device side

⁵ A multi-mode glass optical fiber with a 62.5/125µm or a 50/125µm core

⁶ Or PORT 2

5. Check if the POWER LEDs on both **648** units are lit¹.
6. For the **648** units that did not power up, connect the 12V DC power adapters to the power socket and connect the adapters to the mains electricity (not shown on Figure 3).
Make sure that this time the POWER LED lights on each unit.

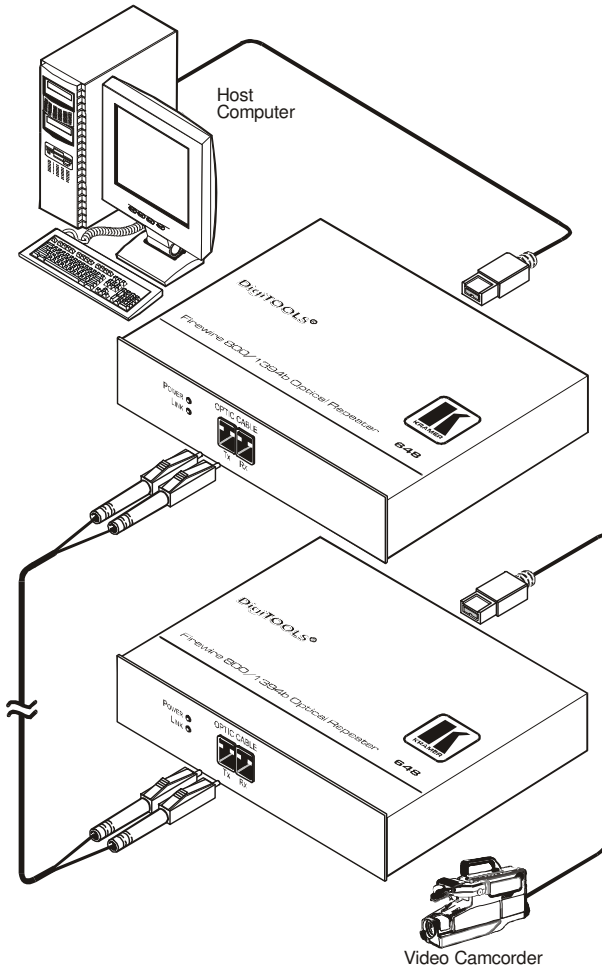


Figure 3: Connecting the 648 FireWire 800/1394b Optical Repeater to a Peripheral Device

¹ If the POWER LED on both units light, the FireWire link is set up correctly and the system is ready for use. If one or both of the POWER LEDs do not light, continue this connecting procedure

5.2 Using the 648 to Connect Other Peripheral Devices

You can connect various peripheral devices, such as surveillance cameras, as illustrated in Figure 4:

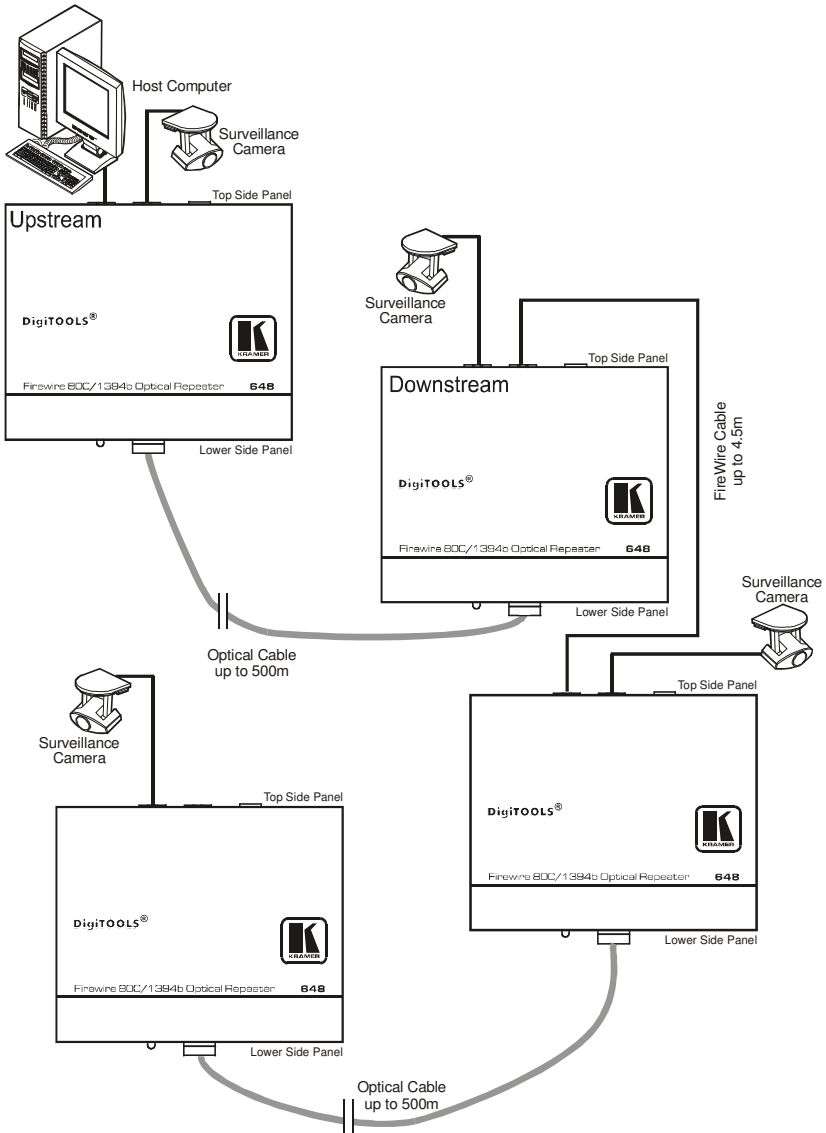


Figure 4: Connecting the 648 FireWire 800/1394b Optical Repeater to Surveillance Cameras

5.3 Interconnecting the Bilingual Backward Compatible Ports to 1394a Devices

The **648** is also compatible with the IEEE 1394a-2000 standard ports. These ports are still present in many devices and can be connected with a maximum cable length of 4.5 meters (about 15 feet). Connecting an IEEE 1394a-2000 standard port to the bilingual connector on the **648**, lets you extend the distance between such devices.

6 Technical Specifications

Table 2 includes the technical specifications:

Table 2: Technical Specifications¹ of the 648

PORTS:	Two 9-pin serial 1394b Ports
TRANSFER RATE:	100/200/400/800 Mbps
STANDARDS:	Fully supports the provisions of the IEE 1394b standard and the IEEE 1394-1995 Standard for High Performance Serial Bus and the P1394a Supplement; Fully interoperable with FireWire™ and i.LINK™ implementation of IEEE Std 1394; Fully compliant with OpenHCI requirements;
POWER SOURCE:	12 VDC, 150mA
DIMENSIONS:	12cm x 10.05cm x 2.76cm (4.7" x 3.95" x 1.08", W, D, H)
WEIGHT:	0.3 kg. (0.67 lbs.) approx.
ACCESSORIES:	Power supply, bracket installation kit, 1 FireWire 9-pin to 6-pin connector cable

¹ Specifications are subject to change without notice

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed.
3. Damage, deterioration or malfunction resulting from:
 - i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
 - ii) Product modification, or failure to follow instructions supplied with the product
 - iii) Repair or attempted repair by anyone not authorized by Kramer
 - iv) Any shipment of the product (claims must be presented to the carrier)
 - v) Removal or installation of the product
 - vi) Any other cause, which does not relate to a product defect
 - vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

- EN-50081: "Electromagnetic compatibility (EMC);
generic emission standard.
Part 1: Residential, commercial and light industry"
- EN-50082: "Electromagnetic compatibility (EMC) generic immunity standard.
Part 1: Residential, commercial and light industry environment".
- CFR-47: FCC Rules and Regulations:
Part 15: "Radio frequency devices
Subpart B – Unintentional radiators"

CAUTION!

- ☒ Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- ☒ Use the supplied DC power supply to feed power to the machine.
- ☒ Please use recommended interconnection cables to connect the machine to other components.



For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found. We welcome your questions, comments and feedback.



Caution

Safety Warning:

Disconnect the unit from the power supply before opening/servicing.

Class 1 Laser Compliance



This product complies with “21 CFR 1040.10” and “EN 60825-1”.

CLASS 1 LASER PRODUCT



Kramer Electronics, Ltd.

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